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Effectiveness of blended learning on student engagement

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Abstract

Despite the increase in 1:1 computing initiatives in K-12 schools and increased technology use in higher education for blended learning, there is little empirical evidence of significant gains in learning outcomes. The use of the 1:1 initiatives to support student blended learning is the intent and purpose, but improved learning outcomes will not occur solely from investment in devices. This review investigates the promises and emerging research evidence of effectiveness of blended learning as a way to augment learning initiatives both in K-12 and in the higher education settings. This review draws from 30 peer-reviewed studies published in academic journals, doctoral dissertations, and academic books that analyze blended learning on student engagement. The emphasis focuses the comparison between traditional and blended learning environments, the best practices for implementing a blended learning environment, and the changes being made, over time, to improve student engagement in the blended learning environment.

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Abstract

Despite the increase in 1:1 computing initiatives in K-12 schools and increased technology use in higher education for blended learning, there is little empirical evidence of significant gains in learning outcomes. The use of the 1:1 initiatives to support student blended learning is the intent and purpose, but the support for improved learning outcomes will not occur with sole invest in devices. This review investigates the promises and emerging research evidence of effectiveness of blended learning as a way to augment learning initiatives both in K-12 and in the higher education settings. This review draws from 30 peer-reviewed studies published in academic journals, doctoral dissertations, and academic books that analyze blended learning on student engagement. The emphasis focuses the comparison between traditional and blended learning environments, the best practices for implementing a blended learning environment, and the changes being made, over time, to improve student engagement in the blended learning environment.

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Introduction

The traditional classroom model, as identified by a *one-size-fits-all* one with courses of fixed length, content, and pedagogy, is on the way out (Alvarez, 2005). In their place is a student-centered model that better engages students with accessible and engaging learning opportunities. This review investigates the change from a traditional classroom model to a blended learning model that incorporates the strengths of both pure e-learning and traditional learning, conferring an advantage to students in this new learning environment (Azizan, 2010). Due to the "best of both worlds" potential, blended instruction has been touted as a viable instructional model that will increase student performance (Doo-Hun & Morris, 2009; Osguthorpe & Graham, 2003).

Blended learning is defined as an instructional method that combines online interactions with traditional methods of instruction (Bonk & Graham, 2006). This form of learning uses regular classroom interaction and simultaneous use of web – based materials accessed by the student outside of class meeting hours (Garrison & Kanuka, 2004). Blended learning specifically refers to a situation in which 30% to 79% of student interaction is achieved online (Bonk & Graham, 2006). Online interactions can take the form of discussion forums, online activities, and lectures that are done either asynchronously, which means that the lectures are recorded and the students watch them afterwards, or synchronously, which means that the student is watching the lecture real-time. The 1:1 computing initiative, in which every student has his/her own electronic device, whether it is a laptop, traditional machine, or mobile learning device makes blended learning a reality (Bonk & Graham, 2006).

There are multiple methods of implementing blended learning in K – 12 settings and higher education. One form of blended learning refers to how teachers use technology during teaching. For example, the face-to-face classroom uses technology as a supplement and a rotation pedagogy has students alternate between a self-paced online module and traditional classroom teaching. Another form - the most common form of blended learning is called self-blend, in which a student may elect

to take an online course at any time as a supplement to normal classes (Bonk & Graham, 2006). However, this type of class is not integrated with normal face-to-face schooling.

Blended learning presents a number of potential benefits over traditional models. It is more flexible than traditional methods of instruction, allowing students the ability to work at their own pace and receive individual attention (Horn & Staker, 2011). In many cases, blended learning is less expensive than more traditional methods of learning, since fewer teachers are required and fewer school resources are needed to support in-class learning. In addition, students who already spend a great deal of time using the Internet may find a blended environment to be more comfortable than one involving merely face-to-face interaction.

In the midst of 1:1 computing initiatives, it is clear that blended learning formats fit into these initiatives as they establish more possibilities than the traditional classroom, especially through the use of technology. However, the problem is it known that the 1:1 initiative is working? How is it assessed? How does the 1:1 initiative move from the implementation of devices to the inclusion of new instructional pedagogy, like blended learning, to improve student engagement and achievement in the classroom?

The purpose of this review is to examine the research evidence of how blended learning changes student and teacher attitudes and outcomes, the comparison between traditional and blended learning formats as well as the best practices for implementing and maintaining blended learning formats, and the current changes being made to blended learning. Such information can help teachers understand the effects of blended learning on student engagement so that they are able to design and develop effective blended learning experiences for their students. This review can also help administrators and departments implement programs in their schools and institutions, as well as advise administrators and departments on how to train and support both instructors and students when deciding to implement blended learning.

Towards that purpose, this review was compiled using the following questions as a guide:

1. What is the difference between traditional and blended learning environments and what best practices are followed to create an effective blended learning environment?

2. What are the effects of blended learning environments on academic achievement?

3. What changes are being made, over time, to improve student engagement in the blended learning environment?

Methodology

The start of the search for resources was conducted through a Google search. The Google search uncovered a series of learning resources that helped the reviewer become more familiar with the current state of blended learning environments in K-12 education and higher education. Through this initial Google search, the reviewer was able to identify quality resources that were referenced in secondary learning resources and some quantitative studies. The access to these additional resources through this initial Google search allowed for the reviewer to begin collecting quality sources. Additionally, the initial Google search generated a number of webpages and documents that had an overarching view of blended learning environments. References from these webpages, such as the Department of Education's "Evaluation of evidence – based practices in online learning", were located so they could be assessed for the appropriateness of being individually included in the project.

After the initial Google search, a more specific, detailed approach was used. The reviewer used Google Scholar, UNI Rod Library One Search, and ERIC to locate peer-reviewed journals, and book resources. The preliminary search used the terms *blended learning, high school, self-efficacy* and *engagement* as the broad nature of the topic generated 6100 hits. Then a variety of combinations of the above terms were used to narrow down the topic to 570 hints. The reviewer felt it was imperative to have the most updated research on the topic and therefore the advanced search technique with a specific date range helped support this approach. As a result, research on specific outcomes was confined to the last five years, while all supporting documentation was from the last ten years, with the exception of one textbook that covered the history up until 2003. Addition of the term *.pdf* allowed the reviewer to locate full published papers that were in the public domain and easily accessible without the need for paying an access fee.

The resources collected at the end of the search included blended learning instruction both in a traditional-based classroom approach and a more progressive learning environment that included online learning components. The research centered on the ideas of learning presence and how a student can

learn in a self-regulated learning environment that nourishes a student's self-efficacy for the learning opportunities in the blended course.

The procedure for analyzing sources started with identifying the numerous peer-reviewed articles gathered, then narrowing it down to thirty peer-reviewed articles, then breaking down each source to identify descriptor words that match the review topic and keywords. The abstracts for each peer-reviewed resource were read and the reviewer looked for descriptors and keywords within the abstract to see if the source matched the premise of the literature review.

Criteria used to evaluate the resources found followed six criteria. The criteria was used for judging accuracy and quality of the source, identifying the authority or the author of the source, the purpose/objectivity to detect bias, the corroboration/coverage to identify the thoroughness and consistency of the information, the currency to review the time when the information was produced and how updated it is, and lastly the relevance of the information as it identifies how well the resource fits the needs for this literature review.

Articles from journals viewed as unnecessary or non-selective were rejected. Research reports from individual schools were used as part of larger examples, since their results are often extremely limited. Research reports from non peer-reviewed sources were used to help in obtaining background information. However, reports published by for–profit Educational Maintenance Organizations (EMO) and other private companies with a financial stake in the outcome, as well as reports by partisan educational groups were not considered. Finally, documents more than 10 years old were not included except to describe terms that have not changed or to give a historical perspective from a classic study.

Maintaining these characteristics was extremely challenging because school districts, educational organizations, and governments looking to evaluate their efficacy have done the majority of online studies on blended learning. These documents were used sparingly, primarily because they had collated results of individual studies from several dozen high schools in the United States.

Analysis and Discussion

Blended learning environments can have a range of effects on student learning. The analysis of blended learning emphasizes several questions, such as, what are the effects of blended learning environments on students, what best practices are used to create the blended learning environment, and what changes are being made, over time, to improve student engagement in the blended learning environment. The use of higher education studies to determine the effectiveness of blended learning was primarily considered as there are more studies conducted on its effectiveness at this level. Any benefits or challenges of the blended learning environment in higher education should be considered at the K-12 level as the recommendation for school districts or institutions to move from a traditional learning environment to a blended learning environment will come at the end of this review.

Comparison of Traditional Learning and Blended Learning

Many studies compare the blended learning environments of instruction with traditional face-to-face models of instruction. Success in the learning environment can be measured in several ways. Student academic success can be measured by tests given at the end of a course, either as part of a standardized testing protocol or as part of the schools own test battery. Student success can also be measured by the amount of student engagement; the satisfaction the student has with the learning experience, the change in the student's attitudes towards learning, and the presence of any side benefits of being present in a blended environment. There is emerging research evidence to support the assertion that blended learning produces a better outcome than does traditional learning (Horn & Staker, 2011).

For instance, in a meta-analysis and review of online learning studies on K-12, college, and postgraduate education in the United States, Means, Toyama, Murphy, Bakia, and Jones (2010) evaluated evidence-based practices in online learning across K-12 and higher education settings. The observed advantage for blended learning conditions is not necessarily rooted in the media used per se and may reflect differences in content, pedagogy, and learning time. To that advantage, Means et al.

(2010), highlighted three of the K-12 studies which had significant effects favoring a blended learning condition; one had a significant negative effect favoring face-to-face instruction, and two classroom studies did not contain statistical significance to support face-to-face learning. Means et al. (2010), concluded that there was an across-the-board benefit in achievement and student satisfaction as instruction combining online and face-to-face elements which had a larger advantage relative to purely face-to-face instruction than did purely online instruction. Means et al. (2010), further concluded that many of the studies in the meta-analysis show an advantage for blending learning as its significant effect was the combination of *time spent*, *curriculum,* and *pedagogy* and additional learning time and materials as well as additional opportunities for collaboration, that produced the observed learning advantages. At the same time, one should note that online learning is much more conducive to expansion of learning time than is face-to-face instruction. In summary, Means et al. (2010) indicated, even though the report looked at K-12, college, and postgraduate education in the United States (with the results derived for the most part from studies in other settings – e.g., medical training, higher education), there was, nonetheless, a significant effect and these results have been discovered by other studies done in other countries.

Particularly, in a study conducted on high school students' attitudes toward a biology class in Turkey, significant positive effects were found by the use of blended learning (Yapici & Akbyin, 2012). One hundred and seven high school students in Turkey were divided into two groups. The 1st group of 60 participants were taught by the conventional model, while the 2nd group of 47 participants were taught via a blended learning model. Students in the blended learning environment were trained on how to use components of the blended learning environment, which was primarily a website that served as a nexus for class information. This blended learning consisted of preparation for the class via videos, Internet-based materials, and Internet searches. Students were allowed to submit their homework online and to discuss their class work in an online forum. The rest of the interactions occurred in the classroom. The students of the experimental group and the control group were given a

biology achievement test and the Internet Use Attitude Scale (IUAS) before and after the module. The IUAS measured students' attitudes towards the use of the Internet in Education Research Social Interactions, Communication, and Information Sharing, as well as Enjoying Internet Use in Education. Scores on both the biology pretest and the IUAS pretest were similar between the 2 groups. However, the blended learning group scored better on the achievement post-test than did students in the traditional classroom. In addition, students in the blended learning environment displayed higher IUAS scores at the end of the module than they did at the beginning. They viewed the use of the Internet in education, research, and information sharing more positively at the end of the experiment than they did at the beginning. The researchers concluded that blended learning was an effective tool for increasing both student achievement and student attitudes towards Internet use. The researchers noted that the positive effects of blended learning included better student preparation, better self – directed learning, and better means of clarifying material with which they were struggling. They also concluded that the most effective methods for achieving successful outcomes in blended learning included computer – literate teachers' web pages with a variety of modules and learning tools, and appropriate structure of the online materials prior to the initiation of the class. One limitation of this study is that it was used in only a small segment of the biology class. Biology is a topic that is very visually oriented, which means that a similar outcome might not be achieved in an English class that could not benefit from animations of complex material. In addition, the study was relatively small and conducted in a foreign country, where the conventional methods of education may be especially ineffective at teaching biology or where student attitudes towards course material may differ. However, it does present some research-based evidence that blended learning can generate successful student learning outcomes.

Beyond the high school setting, in a large scale study that examined face-to-face, blended, and fully online courses at the University of Central Florida, Moskal, Dziuban, and Hartman (2013) noted that students in a blended learning or face-to-face environment tended to succeed (as defined by getting an A, B, or C grade) more often than students in fully online classes. This study looked at course

ratings at UCF for over one million student responses for academic years 2008-2011 indexed by course modality. Since their study could be problematic given the nature of the responses and the evaluation connection to preference of instructor, rather than course modality, the researchers approached this problem by using a data mining method of classification and regression tree analysis (Breiman, Friedman, Olshen, & Stone, 1984) to determine decision rule models for the overall rating. The variables used for prediction were course-level (lower undergraduate, upper undergraduate and graduate), college membership, and the other 15 items on the end of course rating instrument. According to Moskal et al. (2013), this expansive data (Table 1) provides a final piece of evidence that complements and extends the student satisfaction data: the question of success in various course modalities.

Table 1: Success and Withdrawal Rates by Modality

Success and withdrawal rates by modality.

Success by modality		
Modality	n	Success (%)
Blended	69,436	90.8
Fully online	188,776	88.3
Face-to-face	839,028	87.7
Lecture capture	16,354	83.9
Blended lecture capture	45,213	84.7
Withdrawal by modality		
Modality	n	Withdrawal (%)
Lecture capture	18,037	5.3
Fully online	188,916	4.3
Face-to-face	933,846	3.1
Blended lecture capture	55,665	3.0
Blended	70,045	2.8

In addition to measuring student success from course modality, it is important to note that blended courses were as likely to be rated excellent as fully online or face-to-face courses. Blended courses showed an advantage when looking at the number of students who withdrew: students in blended courses tended to withdraw at half the rate (2.8%) as students in classes that were only achieved by recorded lectures (5.3%), though there is no significant difference between blended classes and traditional face-to-face classes. In this same study, learning outcomes for students who had some amount of online learning were significantly better than students who only had traditional forms of

instruction or for students who were only receiving online, distance education. Indeed, students were generally positive about their experience in the blended classroom. They felt that this model allowed more flexibility with their schedule, while face-to-face interaction allowed them to clear up any problems or questions that they experienced when working on their own. However, these results cannot be generalized to all students. Individual approaches to technology and education may change the outcomes and the blended learning environment. This conclusion suggests that any improvement in learning outcomes is a result of the mixing of two teaching techniques and not just the presence of technology. Although success is a complex and difficult outcome to define and measure, it can still be accounted for when a study looks at student progress from course to course across the curriculum. If progress is made, then it can be one measure of students' success within the college. When comparing this study from Moskal et al. (2013), to the previous study by Yapici & Akbyin (2012), there are some distinctions that suggest blended learning can improve student engagement as it helps improve student preparation, increases self-directed learning, and helps clarify difficult information. Now, as the UCF study is added to these findings, it is evident that the course modality can dictate the success and withdrawal rates of the students. The blended learning classroom earned a higher success rate (90.8%) and experienced less student withdrawal (2.8%) than the other types of course modalities.

Another college-based study examined the impact of blended learning on 64 students taking classes in computer science (Akkoyunlu & Soylu, 2012). The blended learning aspects of this course were an online discussion forum and a website use primarily for distributing materials. The rest of the class was taught in the traditional face-to-face manner. Students were introduced to the website, which was monitored by instructors, and were constantly asked throughout the semester to evaluate their experiences using the technology. During this time, improvements were made to the technology in order to accommodate student requests. At the end of the class, as throughout, students were asked their opinions about the class, including how they felt about the content, face-to-face component, an online component. The researchers found that students in general preferred the face-to-face method.

However, students who performed better in the class tended to rate the online environment and components higher than students who were performing more poorly. Students with low achievement found the website difficult to use, though the researchers could not tell whether unfamiliarity with the Internet was the primary cause of lower performance. In this context, the researchers noticed that evidence who were low achievers did not understand why the online component was required, nor did they use it as effectively as higher achievers. High opinions of the web environment were also found in students who used the web more often. The authors concluded that students who are engaged in blended learning and who understand its purpose tend to rate their experience higher. They noted that the best outcome could be achieved by a combination of synchronous and asynchronous teaching. One limitation of the study is that it could not determine whether unfamiliarity with the web environment, in spite of training by the school, led to lower achievement because the student simply did not know how to access the required materials. In order to clear up this question, extended training and potentially a remediation course before the experiment might remove this variable. Also, as with the biology experiment, a course in computer science lends itself very well to a multimodal visual website. Finally, the constantly changing website may have proved detrimental to some students who were not as proactive in making their needs known. As a result, the website might have been specifically tuned for students who are asking for changes and moved away from a style appealing to students who were not proactive in making such request to the experimenters.

Determining the best practices in blended learning has been a challenge for numerous school systems. As indicated in the review of Horn & Staker (2011), even after looking at 40 different fully or partially blended schools across the nation, there is still minimal evidence to determine the most effective blended learning model. The best practices are only assembled after teachers have been labeled as far above average. That is, the results of these teachers are broken down and from those characteristics, a set of standards is assembled, but in most cases these results have been collected at the higher education level and not the K-12 setting (Garrison & Kanuka, 2004). It seems somewhat

backwards, but since blended education is still a developing and home-grown field, it is not surprising that this tactic is being taken for potential implementation of blended learning in the K-12 setting,

In the qualitative study conducted by DiPietro, Ferdig, Black, and Presto (2010) about the strategies and characteristic of best blended instruction of 16 virtual school teachers from the Michigan Virtual School (MVS), The topic of this study was to identify best-practices of blended instruction by collecting triangulation of the practice. Participants were interviewed twice during the study. The first interaction provided an opportunity for the researchers to describe the study and answer any questions participants had. For the purposes of this study, the interviews used the streaming audio feature of the software, built-in audio recording tool, and the shared workspace. The researchers' analysis began by coding data after the completion of the first interview. The goal of coding was to identify those concepts that were repeatedly present in the data and was what ultimately lead to the synthesis and formation of the theory. Along with the process of focused coding, a constant comparison of data sets provided additional means for forming categories and identifying analytic distinctions. Using the constant comparison method provided a basis for establishing the study's validity, and demonstrated the symbiotic relationship between data collection and analysis. During the second interview, participants were asked to respond to a series of interview questions. The seven questions developed for the second portion of the interview were semi-structured, providing a general framework for the conversation. Using a semi-structured interview protocol provided participants with an opportunity to address aspects of successful virtual school teaching based on their own experiences. The questions were designed to prompt participants to provide a description for their pedagogical practice, in relation to the general strategies they use, their specific use in relation to the content area they teach, and the use of technology. The three topics that formed the foundation for developing the interview questions also provided an opportunity to analyze the data collected using several points of comparison.

In the study by DiPietro, Ferdig, Black, & Presto (2010) which explored the best practices used in their blended instruction, analysis began by coding data after the completion of the first interview. The goal of coding was to identify those concepts that were repeatedly present in the data and was what ultimately lead to the synthesis and formation of the theory. Along with the process of focused coding, a constant comparison of data sets provided additional means for forming categories and identifying analytic distinctions. Using the constant comparison method provided a basis for establishing the study's validity, and demonstrated the symbiotic relationship between data collection and analysis. Twelve general characteristics, two classroom management strategies, and twenty-three pedagogical strategies emerged from the data analyses. These strategies and characteristics were represented, observed, or stated by all participants.

The researchers identified four important implications for their work in this study. First, the strategies they identified from the 16 teachers at MVS provide a basis for professional development as well as standards to be developed and tested. Second, classroom management is an area of future research concern. Best practices for blended learning derive from being able to successfully manage the classroom. Third, the attention of this study has bolstered the integration of blended learning as this research establishes a research based set of practices associated with virtual school teaching which can facilitate the exploration for teaching in a blended learning environment. Finally, there are general characteristics that seem to be true of effective virtual, blended, or face-to-face teaching, but these general characteristics need to be explored in further research that uses the findings of this study and turns them into survey or observation tools for broader use.

In addition to the study of teachers from the Michigan Virtual School, the challenges that these teachers needed to overcome included creating and maintaining strong student relationships without the advantage of seeing their students every day, as well as needing to adapt traditional learning methods to online technology that can itself interfere with effective learning. While this example covered courses

that had only an online component, these sorts of skills and challenges will be present in courses where the bulk of the teaching is accomplished asynchronously.

The best practices for creating a blended learning environment are to emphasize a flexible approach to course design that supports the blending of different times and places for learning, offering some of the conveniences of fully online courses without the complete loss of face-to-face contact. The result is potentially a more robust educational experience than either traditional or fully online learning can offer (O'Connor, Mortimer, & Bond, 2011). This paper from O'Connor, Mortimer, & Bond (2011) discusses the use of blended learning where the use of traditional lectures and tutorials is supplemented, and often replaced to some extent, by new approaches to learning. It reviews some of the reasons for the introduction of blended learning and addresses the potential benefits and some of the potential issues that need to be considered when using innovative teaching strategies in a blended learning setting. The authors use examples from their experiences with blending learning to argue that new approaches to teaching, such as student-centered and blended learning, offer considerable opportunities to improve student experience. Their findings conclude that proper attention must be paid to integrating the *new* and *old* aspects of quality teaching, as well as appropriate development of administrative systems and support, in order to successfully follow a best practices approach to creating an effective blended learning environment.

The majority of research on blended learning has been accomplished in the college setting. Newer research on blended learning in high school has set forth certain best practices that take into account the unique needs of teenagers in the high school system. In order to design exceptional blended learning classes, educators must take into account the following (Watson, 2008):

- How much online instruction occurs
- The amount of time spent per day on online education
- The role of the online components
- The role of the teacher, potentially as leader or supporter of education

- The role of the student in their learning
- The amount of student support
- The ratio of student to teacher

Clearly, there is evidence suggesting blended learning is an effective approach in the classroom. Whether this will translate into better academic success overall is something that needs to be researched further. In addition, more research needs to be done in K-12 classes across a number of disciplines to determine whether these benefits can be completely generalized from college to K-12 settings.

In another example, Shapley, Sheehan, Maloney and Caranikas-Walker (2010), conducted a large scale study that included 42 participating schools from grades 6 to 8 drawn from rural, suburban, and urban locations across Texas and most students in the study were economically disadvantaged (67%) and they were racially and ethnically diverse (roughly 56% Hispanic, 7% African American, and 36% White). This study collected data from qualitative and quantitative sources. The concentration for this study was on data gathered through observations through researchers' site visits. Additionally, data measures included annual online teacher surveys and student paper-and-pencil surveys. According to Shapley et al. (2010), the study's quasi-experimental research design had good internal validity given that initially there were no statistically significant differences between the treatment and control schools.

The major findings of the study focused on the teachers and teaching and students and learning. This study identifies the outcomes of the Technology Immersion initiative being implemented. The findings from the teachers and teaching found that experiment teachers grew in technology proficiency and their use of technology for student learning activities grew at significantly faster rates than control teachers; teachers express significantly stronger ideological associations across years with technology integration and learner-centered practices; and the introduction of this study's Technology Immersion components in schools affected teachers' perceptions of the school's culture as

well as the frequency of teachers' collegial interactions. The findings from the students and learning found that economically advantaged and disadvantaged students became significantly more technology proficient than their counterparts in control schools; students used technology applications more often in their core-subject classes and they interacted more often with their peers in small-group activities; and there was no evidence linking this study's Technology Immersion program with student self-directed learning or their general satisfactions with schoolwork.

These conclusions highlight the active use of computing devices in the classroom, an increase in technology proficiency, a stronger link to learner-centered practices (but little evidence to see the move from teacher-centered to learner-centered classrooms), improved use in technology applications and more interactions, but little pedagogical direction and certainly a use of technology that falls short of meeting the learning goals and outcomes of the students as most students did not feel the program helped them in self-directed learning or their general satisfactions with schoolwork. These conclusions will be considered when analyzing the effects of blended learning on academic achievement beyond the K-12 classroom and within the K-12 setting.

Effectiveness of Blended Learning on Academic Achievement

Blended learning evolved from a number of different viewpoints on how the media should affect learning (Bonk & Graham, 2006). Historically, teaching models have been limited by the number of ways that teachers could interact with their students. For example, without distance education technologies there was no high-fidelity way for a teacher to have a meaningful simultaneous interaction with students in multiple locations (Bonk & Graham, 2006). Similarly, there was no way for students to provide relatively quick feedback, oral or verbal, to a teacher who might be located in another state. As a result, there was a division in the types of teaching. There was either face-to-face learning, in which all of the education was accomplished in the traditional way, or distance education, accomplished primarily be remote usage of digital materials (Bonk & Graham, 2006).

Face-to-face learning was, as it still is today, teacher-driven, highly interactive, and synchronous. Historically, early distance education was based almost wholly on the speed of the learner as he/she interacted with low-fidelity, i.e., written, materials (Bonk & Graham, 2006). While this approach allows students to learn topics not available in their schools; being forced to educate themselves using digital materials hindered their experience. In reality, this is only a small step up from distance education classes that consisted of mailing worksheets to a professor in another state.

As technology has evolved, however, these two spheres have begun to overlap. Human interaction on a large scale no longer requires all participants to be in the same room. Material can be distributed synchronously back and forth between students and teachers both in the United States and across the globe. This advancement allows teachers to maintain a high level of interaction without necessarily losing fidelity of transmission. Modern blended learning continues to take advantage of new modes of technology and will continue to evolve as it had before to increase student academic achievement through learning opportunities that are self-paced, the use of preferred learning modalities, and the ability to receive frequent and timely feedback on their performance for a far higher quality learning experience (Horn & Staker, 2011).

In another report by Public Impact (2013), the researchers concluded that student achievement can improve by moving from a blended classroom to a better blend. The ingredients involved in the better blended learning environment rely on personalized learning and excellent teaching. Public Impact's work on highlighting these ideas and the other important ingredients in making a better blended learning environment are outlined in the table below (Table 2). As stated on their report, Public Impact's mission is to dramatically improve learning outcomes for all children in the U.S., with a special focus on students who are not served well.

Table 2: Ingredients for Enhancing Teaching Effectiveness

Ingredients for Enhancing Teaching Effectiveness	Blended Learning Implemented *Without* Enhancing Teaching Effectiveness	Blended Learning *Combined with* Enhanced Teaching Effectiveness
Selectivity	Implement blended learning with current teaching staffs (as many schools do now), or with fewer teachers, with cuts made based on "last in, first out" policies or other quality-blind measures. Schools would see the direct benefits provided by new digital content, but students would experience the same mix of teacher effectiveness they do now.	Use the opportunity blended learning presents to "shift the curve" of teacher effectiveness, through selective hiring. As teachers leave schools through natural attrition, schools can refrain from hiring replacements for low performers who leave, and become much more selective in hiring, enabling students to have much better teachers, on average, year after year. Such efforts would bring schools up to par with hiring practices in top-performing countries, which typically have highly selected admissions into teacher preparation programs, and rigorous training and hiring standards.

Extended Reach	Implement blended learning with the same number of teachers, distributed as they are now - a system that typically results in the top teacher reaching the same number of students as the least effective teachers. Digital learning enables smaller group sizes and different time allocations within classrooms, but excellent teachers would still reach the same number of students they do now. The same number of students would have the school's least effective teachers as well.	Use digital learning specifically to extend the reach of excellent teachers so more students benefit from their highly effective instruction. When students spend time in age-appropriate amounts of digital learning, teachers can teach other students, increasing their reach by 33 percent or more. When elementary teachers also specialize in their best subjects or roles, they can reach 2 to 4 times as many students as they do today. Or they can spend the saved time leading teams of other teachers, extending their reach even more. All of these models distribute leadership and drive for excellence to teachers, reducing the reliance on the limited supply of superstar school leaders. For more examples of models and other resources that can enable schools to extend the reach of excellent teachers to more students, for more pay, within budget, see www.OpportunityCulture.org
Freed Time	Add digital learning within current schedules, making no changes to the amount of time available to teachers for collaboration, planning, and professional development.	Rethinking scheduling within new, blended models. The time students are spending on digital learning can be used, in part, to enable teachers to develop, collaborate, and plan. And schedule shifts can make teachers more effective by giving them time to analyze the increasing amounts of data available in blended models, using the data to inform instruction. All teachers can produce excellence as part of a team and gain opportunities for job-embedded development under the guidance of their excellent peers.

Accountability	Integrate blended learning into instructional models without altering which teachers are accountable for student performance.	Rethinking staffing models to put excellent teachers in charge of more students' learning, increasing excellent teachers' reach in part through leadership roles that give them direct credit and accountability for the growth of all students taught by the teachers they lead.
Authority	Treat digital products like textbooks, with long-term licenses purchased at the district or even state level.	Vest great teachers with the authority to choose and change digital products based on their experiences in the classroom. Give fully accountable teachers a portion of the school's materials and technology budget to select what will work best for their students. Teacher-level control of the digital content used in classrooms would lead to digital solutions more closely tailored to student and teacher needs, and would foster a marketplace in which excellent teachers drive quality.
Rewards	Use any savings generated by blended models for increased investment in infrastructure or digital content, or cut funding for blended schools based on their anticipated ability to operate with less money.	Invest most or all savings in teachers by paying them more. Schools can pay all teachers more, and may offer even higher pay for excellent teachers who extend their reach further, including those who use multi-classroom leadership to help peers succeed. In either case, schools may reap benefits in the recruitment and retention of excellent teachers, further expanding student access to excellence.

Although the ingredients of blended learning combined with enhanced teaching effectiveness are novel, the measurable effectiveness cannot be fully calculated without more data collected from this better blended model in the high school setting. At first glance of the Public Impact study (2013), it is evident there are ingredients for enhancing teaching effectiveness and ultimately student achievement,

but more specific analysis of the research is necessary to see what the research evidence suggests for specific, pedagogical approaches to improving student achievement.

The biggest emphasis for the implementation of the blended learning model is to provide a meaningful learning experience. To create transformational learning environments, the design discussion must include how learners can learn and how instructors can teach in new ways (Wenger & Ferguson, 2006). These researchers compiled data from their Sun Microsystems organization, which is a worldwide provider of informational technology (IT) infrastructure solutions and services. Their research derives from nearly 250,000 students who participate in their 250 courses each year. Data compiled from their courses has enabled them to develop a *learning ecology* which is used to guide the design and deployment of blended learning solutions in the global IT training market. The work conducted by Wenger & Ferguson is important for showing how effectively structured blended learning environments contribute to academic achievement. Their work on developing the *learning ecology* to support blended learning could be used in the higher education or K-12 setting, but their intent and purpose will continue to focus on the business world. To conclude their work, they highlight an effective blended learning environment includes a quality learning experience, student control over the learning experience, the distinction between formal and informal learning, and a focus on how learning is a social process.

Another look at effective blended learning environments focuses on blended courses that integrate collaborative, problem-based, or constructivist learning environments to promote interaction and meet the needs of learners are perceived to be quality courses (Picciano, 2009). The purpose of this article is to propose a blending with the multimodal conceptual model. The proposal calls for designing and developing blended learning courses and programs through this multimodal conceptual model. A blended learning model is presented that suggests teachers design instruction to meet the needs of a variety of learners. Academic achievement can be obtained through the multimodal model as it recognizes that because learners represent different generations, different personality types, and

different learning styles, teachers and instructional designers should seek to use multiple approaches including face-to-face methods and online technologies that meet the needs of a wide spectrum of students. As stated by Picciano (2009), a major benefit of multiple modalities is that they allow students to experience learning in ways in which they are most comfortable while also challenging them to experience and learn in other ways as well. The techniques highlighted by Picciano (2009), indicate that academic achievement can improve through dialectic/questioning activities, incorporating reflection, incorporating collaborative learning, and finally, the most important part of improving academic achievement through the blended model is by finding a way for synthesizing, evaluating and assessing learning. Overall, while Picciano's recommendations were based in best practices and explained effectively, the limitation of his work is the inability to provide a solid set of research findings to back up his recommendations. Picciano's work should be revisited for further research and understanding.

All and all, as indicated in the several studies above, the best way to develop a blended learning environment is to create an environment that supports student learning through various pedagogical approaches (e.g. Constructivism, behaviorism, cognitivism) in order to produce an optimal learning outcome with or without instructional technology.

Changes for Improving Student Engagement in the Blended Learning Environment

Changes have been made to the blended learning format to improve student engagement. The blended learning patterns over the years focused on using threaded discussion forums (Caverly & Macdonald, 1999), video recordings and a flexible teaching model, (Bergmann & Sams, 2012), and dedicating more time to professional training for the teachers who plan to move to blended learning (van Raalte & Boulay, 2012).

The first look at the evolution of blended learning lies in the use of threaded discussion forums. The use of discussion forums is not a new concept as indicated by Caverly and Macdonald (1999), they found that "threaded discussion groups foster higher-level thinking and independence as

students collect, evaluate, and create their own learning spaces" (p. 36). This study, though over ten years old, highlights the necessity of looking at what methods have been used to facilitate improved student engagement. The use of their findings, compiled with more recent findings on improved use of threaded discussions, help the reviewer to see if basic principles have remained constant and if not, analyze how they have improved and why they improved. The instructor can use these examples of higher-level thinking on threaded discussions to capitalize on key questions and conversations that previously took place in the online learning environment. Additionally, a blended environment can provide the opportunity for the continuation of discussions not completed during scheduled class time, which, if implemented effectively could lead to the type of threaded discussions outlined in Caverly and Macdonald.

The next step to reviewing the studies on blended learning look at the use of video recordings to support student engagement. Most notably, the emergence of the "flipped classroom" concept which incorporates video recordings in the blended learning environment and promotes a flexible learning environment. Quantitative and rigorous qualitative research on Flipped Learning is limited, but there is a great deal of research that supports the key elements of the model with respect to instructional strategies for engaging students in their learning. A key feature highlighted in the work by Bergmann and Sams (2012), is that the Flipped Learning model presents an opportunity to increase active learning opportunities in the classroom by shifting direct instruction outside of the larger group learning space. Active learning provides students with opportunities to interact with content through reading, writing, listening, talking, and reflecting. Evidence from Bergmann and Sams (2012) indicates that active learning increases student engagement and critical thinking and improves student attitudes.

Unfortunately, as stated previously, the empirical evidence on student engagement is limited and does not give a clear indication that the Flipped Learning model will remain an integral part of future blended learning. However, the data from a survey conducted by Speak Up. Speak Up (2013) is a national initiative of Project Tomorrow; the nation's leading education nonprofit organization

dedicated to ensuring that today's students are well prepared to be tomorrow's innovators, leaders, and engaged citizens of the world. The Speak Up data represents the largest collection of authentic, unfiltered stakeholder input on education, technology, 21st century skills, schools of the future and science instruction. Education, business, and policy leaders use the data regularly to inform federal, state, and local education programs. The Speak Up survey, Table 3, was able to highlight the student engagement benefits of the Flipped Learning model (Speak Up, 2013).

Table 3: Flipped Learning and Democratic Education Survey

FLIPPED LEARNING AND DEMOCRATIC EDUCATION SURVEY

80% **of students agree that they...**

- Have more constant and positive interactions
- Have greater opportunities to work at own pace
- Have greater access to course material and instruction
- Have more choice in how they demonstrate their learning
- View learning as a more active process

70% **of students agree that they...**

- Are more likely to engage in collaborative decision making
- Are more likely to engage in critical thinking and problem solving
- Teacher is more likely to take into account their interests, strengths, and weaknesses
- Are more likely to have a choice in what learning tasks they engage in

Another way to improve student engagement is to provide teachers with more training in the blended learning environment. In a survey of high schools using a blended learning format conducted by van Raalte and Boulay (2012), only 51% of teachers had any formal training. As mentioned previously, many skills valued in regular teaching are helpful in blended learning. However, there are certain skills that are required to make an excellent online segment. Access to hands-on training in blended learning techniques increases teacher skill and teacher excitement about integrating blended learning into their classrooms. The research conducted by van Raalte & Boulay (2012), occurred in 2011. The participants were selected from a pool of biology teachers at the secondary level from the

State of Hawaii, including the islands of Maui, Oahu, and the Big Island. A total of N=12 high school science teachers were invited and participated in the professional development program in June of 2011. The summer program asked for multiple sources of data from the participants (i.e., pre-survey, post-survey, resumes, and final written reflective statements). The post-survey was given to all of the teachers at the end of the program before they left. All teachers responded to the survey resulting in a 100% completion rate. According to van Raalte & Boulay (2012), analysis of the post-surveys and finals statements revealed a vast positive response to the professional development program. Because of the vast positive response, there were three major implications from the study: first, it is apparent that high school science teachers need and appreciate professional development programs; second, teachers frequently reported their use of the learned material in their own curricula; and third, the virtual learning materials proved to be successful in engaging teachers in blended learning. A look at these implications helped the reviewer analyze how the approach to supporting effective blended learning practices would lie within the need for positive, professional training and development opportunities. However, even though there are clear implications highlighted in this study, there are also limitations with the work from van Raalte & Boulay (2013), as it is unclear how the teachers will further use the materials they learned about in this blended learning professional development program, it is unclear if the positive reactions to this training program are reflected in the teachers' classrooms, and lastly, it is unknown how this blended format professional development program compares to other professional development programs. The surveys did not ask for the teachers to compare between programs and while it is implied that effective training programs will translate into effective implementation of blended learning environments and in turn, improve student engagement. These correlations cannot be verified.

As the benefits of the blended learning on student engagement are outlined, it is clear that a long-term plan is needed to support its success. The template for designing effective blended learning environments follows four steps of instructional design that can work closely with the aforementioned

design models. Debra Marsh (2012) describes the essential characteristics of how to improve student engagement in the blended learning environment in her book, *Blended Learning: Creating Learning Opportunities for Language Learners*.

First, the teacher must identify the learning outcomes for the classroom lesson, then identify the activities for students to do in class, then identify the activities for students to do online before class, and then identify the activities for students to do after class (pg. 19). This framework allows for a focus on learning outcomes, focus on communication in class, preparation for class online, and an opportunity for review, extension, and consolidation online. The approach is effective because students are well-supported from the teacher and the learning community, students have opportunities for learning extension and to track their progress, and students are motivated by the interactions available to them from the face-to-face and online components of the blended learning environment.

Additionally, in this student-centered classroom, students:

- are involved in the learning process
- don't depend on their teacher all the time
- communicate with each other in pairs and small groups
- value each other's contributions
- cooperate
- learn from each other
- help each other

This template for designing blended learning supports student engagement at a positive effect of improving student engagement by 5% over the course of the semester based on student participation data from online and offline measurements (Marsh, 2012). While this positive effect is marginal, it is a start and supports the template designed by Marsh.

Conclusions and Recommendations

This literature review attempts to answer the following primary question: What are the effects of blended learning environments on student engagement? As indicated, there are significant differences in learning outcomes between students in blended classrooms and students in traditional classrooms the findings sometimes suggest (Akkoyunlu & Soylu, 2012), (Moskal, Dziuban, & Hartman, 2013), (Toyama, Murphy, Bakia, and Jones (2010), and (Yapici & Akbyin, 2012).

The research evidence supports the assertion that blended learning models as a more effective method of instruction as studies highlight a deeper understanding of content, higher student satisfaction, and improved test scores and evidence from 40 K-12 organizations that have implemented a form of blended learning as models for successful blended learning programs (Horn & Staker, 2011). The evidence from Horn & Staker's review (2011) highlights the potential of blended learning to revolutionize K-12 education in terms of quality and cost, as it allows for a fundamental redesign of the educational model around the following: a more consistent and personalized pedagogy that allows each student to work at her own pace and helps each child feel and be successful at school and productive new school models that require fewer, more specialized teachers and use space more efficiently.

Determining the best practices in blended learning has been a challenge for numerous school systems. As indicated in Horn & Staker (2011), even after looking at 40 different fully or partially blended schools across the nation, there is still minimal evidence to determine the most effective blended learning model. however, consistently significant differences existed in several instructional and learner factors between the two delivery format groups of the face-to-face or the blended learning model. Projections state that the future of online education is blended learning (Bonk, Kim, & Zeng, 2006). Most companies use some form of blended learning, but most post-secondary institutions do not; however, both are predicted to double their offerings (Bonk et al, 2002). There has been a recent shift to introduce blended learning it into education of medical professionals, including allopathic

doctors, nurses, and dentists. Studies have demonstrated significant savings and positive outcomes in training programs that use blended learning (Dankbaar et al., 2014; Ilic et al., 2013). The projection for future blended learning instruction delivery is important as it indicates a pedagogical shift in how we educate future students. As further emphasis is placed on 21st century skills development in the classroom, it will be crucial to support the development of these skills with students. Students will need to learn in a blended learning environment that supports active learning, problem solving, and collaboration that mirrors their future workplaces.

More immediately, students graduating from K-12 education will be entering an academic landscape vastly different from the one experienced by students just a few years ago. Today's higher education institutions have fully embraced blended learning as part of their normal curricula. In a recent study of higher education institutions, 93% were offering hybrid or online courses (CDE, 2012). Students who are already comfortable with blended learning will seamlessly transition to classes that demand facility with the technology. On the other hand, students who graduate from high schools that have not implemented any form of hybrid courses will be a significant disadvantage when confronted with professors who expect their students to be able to, at the very least, upload documents and participate in online discussions. In addition, familiarity with blended learning may encourage students who do not have the opportunity to attend college full-time to engage in online courses that can eventually translate into college credit or a professional certificate.

To determine the most appropriate blended learning model for the classroom, it is crucial to emphasize the personalization of the learning experiences (DiPietro et al, 2010), the variety of blended formats (Staker, 2011), and the distinction between blended and a better blend combined with enhanced teacher effectiveness (Public Impact, 2013), as well as the effective integration of technology as the vehicle to connect the learner to the learning experiences (Rust, 2010). Once a pedagogical theory is selected, content should be combined with technology to create a personalized, challenging, and seamlessly integrated learning experience for the students.

Consequently, when a blended model is selected, classroom-based content can then be combined with new technology in order to establish a balanced, well-rounded educational experience for the students. With a path for success outlined, learners can use classroom technology more efficiently in knowing what is expected and encouraged. Teachers can embrace blended learning by incorporating a variety of technological tools and online experiences to enhance the overall goal of learning classroom curriculum. In addition, blended learning can support the substantial technological goals that are embedded within the national educational standards. Skills such as online communication, online collaboration, and ability to use digital tools effectively are invaluable to our present day students.

The first and most important step in creating an effective blended learning environment is to determine the structure of the class. In particular, the school district, specifically the teachers and administrators, should set out the percentage of the class that will be spent online versus in the classroom with the teacher and how much time per day the student should spend online overall (Watson, 2008). This should occur even before course materials are created, since the amount of instruction time in each modality will dictate the nature of the materials. As mentioned previously, materials and techniques used online may have some overlap with traditional teaching materials, but there are still ways in which class materials must differ to be effective.

In that differentiation, once the course structure has been delimited, the teacher should craft lesson plans that specifically dictate the role of individual assignments and materials in learning. It is not enough to put some worksheets or discussions online. The educator needs to contemplate what these materials are replacing or supplementing in the normal class. For example, teachers can use a discussion forum as a place for students argue freely while maintaining a record of their conversations (van Raalte & Boulay, 2012). Without that kind of structure, neither the teacher nor the students may effectively interact with the materials even if they are well-crafted. Implementation plays as large of a role as quality.

Concurrently, schools need to ensure appropriate education of both teachers and students in the mechanisms and purpose of blended learning. Teachers who are trained well get excited about teaching in a blended classroom, suggesting they will make more thorough use of the technology. Unfortunately, insufficient training is unfortunately the standard, with only 51% of all teachers having thorough instruction on how to implement and participate in blended learning (Murin & Watson, 2012). In addition, students who understand the purpose of blended learning use it more successfully and tend to get higher grades (Akkoyunlu & Soylu, 2012). Therefore, dropping both students and teachers with little training into a blended learning environment is unlikely to generate the strong learning outcomes desired by the schools. Ideally, this training should be done before students formally start class, perhaps as part of an orientation (for the students) or as part of a professional enrichment program (for the teachers).

The final design considerations for a blended learning environment involve finer tuning of the process. Implementation will require support, both academic and technological. The administration should recognize beforehand that technology needs maintenance and support, especially in a 1:1 learning environment. Even with orientation, a student who has not had the opportunity to interact with technology in an academic setting will require rapid remediation. Having difficulty with a subject can mean a lower grade in a single class, but failing at technology can mean the student struggles in all of his blended learning classes.

This review shows that higher education has embraced the blended learning format, but the K-12 needs more time to pilot programs, collect data, and analyze the data to make informed decisions on its use in the classroom. There is an identified need for more extensive research on the effectiveness of blended learning in the K-12 setting. In Horn & Staker (2012), the research they gathered looked at the 40 different K-12 schools across the nation that are implementing a form of blended learning and a review of the recent findings from moving the traditional classroom to a more blended classroom through ingredients that include excellent teaching as a part of the recipe.

In terms of recommendations for teachers for blended learning, further research should include looking at the three elements: active discussion forums, video recordings and a flexible learning environment, and more time devoted to professional development on how to implement blended learning successfully from the sources of (Caverly & Macdonald, 1999) (Bergmann & Sams, 2012) and (van Raalte & Boulay, 2012). Additionally, the teacher should look at the following process to create a blended learning environment. First, a recommendation for successful integration of the blended learning environment should start with the asynchronous and synchronous portions of the class. In this case, it is recommended that the blended environment provides a discussion forum in which additional connections and bridges can be built as the teacher and students work through the material together. In this learning space, a teacher can ask questions of their students and the students can interact with classroom content, together, as they create new understandings. The discussion forum provides a delivery method for reassurance of the student's comprehension of the material that in turn supported their self-efficacy. In class, face-to-face time allows for a deeper level of comprehension to be developed through interactions in which the teacher can synthesize the material, bring ideas together, generate links to larger issues and topics, and discuss the application in the real world. It is encouraged for teachers to use this framework, but to stay abreast of current research on blended learning as the concept is evolving.

The blended learning environment provides a favorable opportunity for teachers. Also, it offers a flexible option for students by providing opportunities for discussion both in a face-to-face and in an online space. The blended learning environment also provides the opportunity to use time in a flexible way inside and outside of class walls that is crucial to dig deep into class concepts. With regard to recommendations for implementation, it is important to not become fearful of the unknown, as preliminary research on blended learning is promising and the potential benefits of implementing a blended learning format to improve academic achievement and student engagement are key areas that must be addressed in today's face-to-face learning environments. Instead, all lessons learned from

face-to-face and online learning formats should be considered as the merging of these formats to create a successful blended learning format much reach beyond the K-12 realm to include higher education and professional training settings as well.

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